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The projected use of light rail and high-speed ferry service in Sonoma county

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THE PROJECTED USE OF LIGHT RAIL AND HIGH-SPEED FERRY SERVICE IN SONOMA COUNTY

A Thesis
Presented to
The Faculty of the Department of
Sociology
San Jose State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts

By
Campbell J. Bullock

May, 2002

APPROVED FOR THE DEPARTMENT
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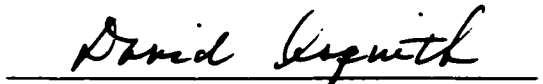

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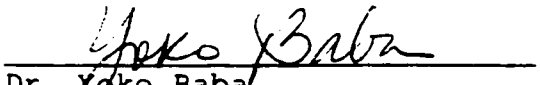

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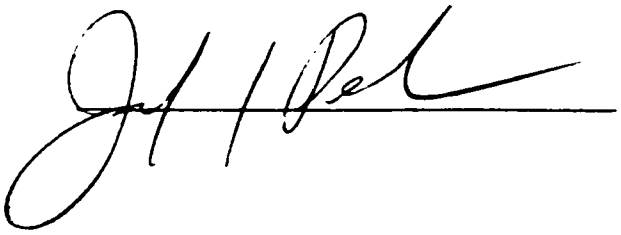

ABSTRACT

THE PROJECTED USE OF LIGHT RAIL AND HIGH-SPEED FERRY SERVICE IN SONOMA COUNTY

by Campbell J. Bullock

This thesis centers on the topic of the modal choices of residents in Sonoma County. This researcher found out which of a specific set of independent variables was associated with the projected use of a light rail and/or high-speed ferry service.

Using a telephone interview, this study uncovered that the independent variables, reliance on a car, access to a car, the amount of time in rush-hour traffic, the flexibility residents have in arriving to work, and the distance residents live from a proposed high-speed ferry terminal were not statistically associated with respondents' projected use of alternative transportation systems.

The variable, distance living from Highway 101, was found to be associated with the projected use of a light rail system.

This investigation suggests that in order to construct a rail service that will be used by large numbers of people, such a system needs to include a network of lateral rail extensions.

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It is important that I thank Dr. Kimberly Skarupski and Dr. Carl Kallgren of the Center for Organizational Research and Evaluation (at Penn State Erie) for their support during the completion of this work. In addition, I owe words of gratitude to Mr. Todd Say and his staff at the computer center at Penn State Erie for the use of lab equipment.

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encouragement have had a sizable impact on my seminar work, comprehensive examinations, and this thesis. It was in Dr. Baba's Sociology 194 seminar, Research Design, that the idea for this thesis was first created. Dr. Baba provided tremendous assistance in both the early construction and later development of this study.

It is essential that I thank Dr. David Asquith. Dr. Asquith, my thesis chair, has proven to be a professor who has not only dramatically enhanced my skills as a social scientist, but has provided a foundation in methodology and statistics that has allowed me to fully appreciate the discipline of sociology. In taking Dr. Asquith's courses, I gained a new found appreciation and excitement about the core components of sociology. Dr. Asquith's detailed and lively lectures, uncompromising assistance and mentoring will remain my fondest memory of San Jose State University.

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I would like to thank my parents, Warren and Lyle Bullock, as well as my brothers, Grant and Andrew. Their support for me and my family during my tenure as a graduate student at San Jose State made the completion of my Masters degree possible. It should be added that it was my parents, in particular, that provided critical financial assistance that allowed me to continue with my studies.

Finally, and most importantly, I dedicate this thesis to Joann Bullock, my wife. Joann's never wavering support for my pursuit of the Masters degree in sociology was the most critical element in me seeing the program through. Joann believed in me and my passion for the discipline of sociology even when I began to consider other academic and career options due to the distance we lived my San Jose. Joann's support manifested itself through countless conversations, words of encouragement and advice, as well as an overall willingness to support my lengthy commutes from Sonoma County and the considerable evening and weekend time I needed to put into the research for this thesis.

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CHAPTER 1

Introduction

The focus of this sociological investigation is on the traffic problems of the Northern Bay Area and the impact that additional mass transportation could have on this highway gridlock. Specifically, this paper looks into whether Sonoma County residents would consider the use of a light rail service and/or high-speed ferry system as an alternative to the automobile to commute to various points around the San Francisco Bay Area.

For anyone who has been in urban and/or suburban highway traffic during peak traffic times the significance of this present study is apparent. In looking at this study's highway locale specifically, traffic congestion has worsened as more and more people continue to work in the Central Bay Area. Yet due to increasing housing prices and rent, and Silicon Valley's cost of living in particular, these people choose to live outside the area and commute into the Central Bay Area; this, subsequently, causes substantial traffic delays. In fact, Stacy Finz of the San

Francisco Chronicle notes that "Bay Area residents are so fed up with the high cost and limited availability of housing that nearly one in four (22%) plan to move before they reach retirement age" (p. A1). In addition, people living in the Bay Area listed housing as more of a concern than traffic (Finz, 2000). So, as these residents move out of the interior Bay Area, many move to the outskirts of the region and commute in order to obtain higher salaries. "Three in four Bay Area residents complain that the cost of housing is forcing people in their area into longer commutes to and from work" (Finz, 2000, p. A16). The concern over housing costs is not found only on the Peninsula.

Peter Fimrite notes that 62 percent of Marin and Sonoma County residents cite the high cost of housing as a substantial problem where they live (Fimrite, 2000). As the Greater Bay Area's population density pushes the limits of an already inflated level, no end of these traffic snarls seems to be in sight. Debate has centered around creating a third lane on the stretches of Highway 101 through Sonoma and Marin Counties; currently, a substantial portion of the freeway only has a two-lane system. Coupled with the above, an automated toll program (FASTRAK) has

been recently installed on the Golden Gate Bridge. Yet, when looking towards the future, both of the congestion dissipating ideas above (more lanes and increased toll booth efficiency) are only short term at best. Arguably, the key issue here centers on the fact that due to increased population and massive resource depletion, transportation systems need to undergo fundamental changes if, in fact, mobility stays a human requirement in the 21st century. Furthermore, the loss of family/personal and business time, and the increase of road rage are also significant signs of a transportation system in poor condition. Thus, the key questions are the following: What are the specific changes that should be implemented in order to alleviate traffic congestion? More specifically, what are the options that the general public would consider feasible for their everyday lives? This study investigates the regional traffic problems and modal choices of commuters.

CHAPTER 2

Literature Review

Study Background: Transportation, Traffic, and Commuting
A Brief Global, National, and Regional Investigation

Before looking at the specific factors that center around the mode of transportation that people choose and the possible reasons for that choice, a brief investigation into global, national, and local traffic concerns is conducted. The issues that center on transportation and human mobility have broad implications on both global and local levels.

Even early in the 20th Century (1905) congestion was thought to be the key problem in the metropolitan areas of the United States (Owen, 1966). This remains a critical point today. Newman and Kenworthy (1999, p. 59) point out that as urban areas grow, a traffic increase of "superexponential rates" can be expected. In conjunction with car use, cities in the United States use 5 times more transportation energy/resources than Asian cities (Newman and Kenworthy, 1999). In addition, Newman and Kenworthy (1999) point out that U.S. car use is 7.3 times that of

Asian countries while the American gross regional product is only 1.26 times as high. Vest, Cohen, and Tharp (1997) add that a Federal Highway Administration study found that out of 50 urban areas in the United States, 70% of the highways in these metropolitan areas were clogged during peak commute times. The above authors add that the number of vehicles driven increased 35% while there was only a 1% growth in road miles; this combination is a key (and obvious) factor in the generation of gridlock: little road space, yet many automobiles. The most recent Census data (2000) indicates that only 5% (.051) of commuters in the United States used public transportation to get to work. The same rate (.053) of public transit use was registered for the state of California. Intensifying the problem, 87% of those driving cars, trucks, or vans, drove alone (Census 2000 Supplementary Survey).

Whereas the national figures in regards to car use are higher than much of the rest of the world, specific figures targeting U.S. regional public transportation use also shed light on the issue of transit choice. Newman and Kenworthy indicate that Detroit, Houston, Sacramento, and Phoenix accumulate less than 1% of total passenger kilometers via public transit. The authors state that such cities "will

rapidly fill with traffic at most times of the day, show severe environmental problems, be economically inefficient, and exhibit few signs of community" (p. 59).

When looking specifically at the San Francisco Bay Area, Gary Richards (2000) reports that gridlock has increased 87% in the last five years. The same author goes on to note that stop-and-go highway mileage grew from 223 miles in 1990 to 375 miles as of 1999. In regards to traffic increase and driving alone, the Silicon Valley saw a 45% rise in solo drivers between 1980 and 1990 (Richards, 2000). Furthermore, average automobile speed while in gridlock went from 35 miles an hour down to 15 (Richards, 2000). One should add that the Bay Bridge was listed as the number one site of delay around the Bay (Richards, 2000); this transbay connection is probably the most highly discussed zone of congestion in the Greater Bay Area. This gridlock is created due to the fact that roadways cannot efficiently move traffic at normal velocity (Lomax, 1997).

Before specifically targeting the North Bay Area traffic and public transportation options and conditions, an examination of the East Bay and San Francisco traffic and their mass transportation systems is fruitful. The Bay Bridge's (a structure that was built in 1936) lower deck

system of trams was removed in 1962 (From the manual: Increasing the Productivity of the Nations Urban Transportation Infrastructure, U.S.D.T.). The United States Department of Transportation points out that smooth traffic flow continued until 1970 when congestion reached a peak level (From the manual: Increasing the Productivity of the Nations Urban Transportation Infrastructure). The Bay Area Rapid Transit (BART) light-rail system began in 1974 as a way to ameliorate this gridlock. When looking at public transportation use a decade later (in 1984), 70.8% of East Bay residents commuted by car, 6.9% by bus, and 22.3% via BART (United States Department of Transportation - U.S.D.T.- manual, 1992). It should be added, however, that the 1990 Census figures indicate lower public transit use (19.5%) for San Francisco, Oakland, and San Jose (U.S. Census figures). Brinkerhoff (1998) notes the fact that BART's original expansion plan included not only San Jose, but light rail access to all nine Bay Area counties including a rail line that reached Santa Rosa.

Downs (1992) warns that gridlock is increasing throughout the United States as well as in regions undergoing rapid growth (e.g., Silicon Valley). One of the Bay Area's newest growth locations is indeed the North Bay.

In fact (as of the year 2000 Census figures), "Sonoma County's growth rate was the highest in the nine-county Bay Area" (Klose, March 31, 2001, p. A9). One should note that this growth rate was only slightly larger than Contra Costa County's growth rate. County growth has become such a concern that the region's traffic (as well as housing and water) infrastructure is strained (Klose, March 31, 2001, p. A1). The issue is quite serious as "...policymakers and political activists expressed worry (on Friday, March 20, 2001) whether the county can continue to accommodate a 10-year, 18 percent growth rate" (Klose, March 31, 2001). In addition, according to a poll taken by The Press Democrat, "residents of Santa Rosa and Petaluma view traffic as a significantly more pressing issue than growth itself" (Coit, 2000, p. A11).

When studying the North Bay region in particular, the 1998 state report of California Traffic Volumes shows that peak-hour traffic congestion is seen to steadily increase with almost no variation as one moves down Highway 101 (southbound) from Santa Rosa to the center of Marin County. In fact, total peak-hour traffic in between College Avenue and Fourth Street in Santa Rosa (located in Sonoma County) is listed at 9,200 cars. In between Lincoln/Villa Avenues

and San Pedro Road (located in Marin County) the peak-hour traffic totals 15,000 cars. Steve Beraldo of RIDES, a rider-sharing advocacy group in Oakland, notes that this congestion brought the Highway 101 average commute speed down from 41 mph in 1999 to 35 mph in 2000 (Wolfe, 2001). In addition, Liebel (2000) points out that between the peak commute hours of 7-8 a.m., amount 6,000 vehicles cross the county line. Liebel also notes that "approximately 70 percent of the morning traffic passing through Petaluma on southbound Highway 101 heads into Marin County" (2000, p. B1). So, clearly, as the Sonoma County residents approach San Francisco via Marin, congestion grows. Lomax et al. (1997) state that gridlock is no longer isolated to urban centers; it has become a substantial regional issue. This can be clearly seen in the regions under consideration in this study.

To help alleviate some of (and, in fact, a substantial portion of) Sonoma County gridlock troubles, a 17.5 million dollar highway widening project has begun on a relatively short five-mile stretch from Santa Rosa to Rohnert Park; this is a portion of Highway 101 which carries 100,000 cars per day (McCoy, 2001). The project consists of adding a third lane to each side of the freeway. "The extra lanes,

when complete, will be designated as car-pool lanes open only to vehicles carrying at least two people during morning and afternoon commute hours" (McCoy, 2001, p. A9). Another area of serious traffic problems within the county is in the small town of Penngrove. Due to the heavy flow of traffic on Highway 101, large amounts of commuters seek to avoid the build-up by driving through adjacent Penngrove. "With back-ups nearly a mile long, tiny Penngrove's daily grind stands out. Penngrove residents are held virtually hostage in homes and businesses during two- to three- hour commuting times" (Coit, 2000, p. A11).

Sonoma County residents are left with very few alternatives to facing daily peak-hour gridlock; in fact, there seems to be only one viable alternative and this option is quite limited. Sonoma County residents can take the Golden Gate Transit bus service down Highway 101. The information about bus service came from a telephone interview with a Golden Gate Transit representative. There are two early morning bus departures from Sonoma County on this regional bus system (one at 4:25 a.m., and one at 5:07 a.m.). Service provided at these hours is not a viable option for most people as the average work day begins at 8:00 a.m. The cost of the service is $5.05 each way. No

round-trip fare is available, yet monthly ticket packets can be purchased. One should note that this fare would not be considered cost effective when comparing it to the cost of gas per trip. This bus is an express service that takes the rider to the Financial District in San Francisco. If a commuter wants to go elsewhere in the city (e.g. connect with the Caltrains rail service) a second bus would need to be boarded to arrive at the new location. Taking a later bus from Sonoma County may indeed mean that commuters do not bypass peak-hour traffic, and find themselves once again in highway congestion.

Upon leaving San Francisco there are express buses leaving in the early afternoon. If a rider is not on one of these buses, however, the commuter is left riding on a non-express bus which makes many more stops and can be delayed in traffic. This non-express bus takes up to 30 minutes longer to navigate the same route. Once again, a later departure time would mean facing traffic delays through Marin, which can begin on some days before 3 p.m. Knowledge regarding peak commute times comes from direct observation of the region's traffic congestion conditions. Peak-hour traffic in this locale can be said, in general, to be consistent with the average congestion times of 6

a.m. to 9 a.m and 4 p.m. to 7 p.m. as noted by Anthony Downs (1992). However, this condition of congestion in Sonoma County actually begins before 6 a.m. Furthermore, these stop-and-go conditions build in Marin County (northbound) before 4 p.m. This author has seen this back-up begin as early as 2:50 p.m (this seems to be a general congestion problem and not one created by sporadic highway accidents).

The nearest ferry service in relation to Sonoma County is in Marin at Larkspur. Clearly such a service with the point of origin in a different county cannot ideally be seen as a travel mode alternative for the residents of Sonoma County. Interestingly enough, however, ferry service was once projected to originate near Petaluma at Point Sonoma, at the border of Marin and Sonoma Counties (Regional Ferry Plan, 1992).

A brief statement on Bay Area transportation costs is essential here before moving into modal choice. "The average Bay Area household spends $7,150 a year on transportation, making getting around the region the biggest expense behind housing" (Cabanatuan 2000, p. A27). In fact, as Cabanatuan adds, these costs "eat up more of the typical family budget than health care, education and

utilities combined" (2000, p. A27). Cabanatuan (2000) notes that this transportation cost calculation includes fuel taxes, gas, insurance, cost of vehicle, maintenance, as well as the cost of public transportation. According to the Surface Transportation Policy Project conducted by the Center for Neighborhood Technology, four North Bay Area cities (i.e., Windsor, Cloverdale, Sebastopol, and Sonoma) are ranked as among the worst in terms of affordable transportation (Cabanatuan, 2000). These ratings came about in part due to the fact that "more compactly developed cities have better mass transit access and easier walks to stores and schools..." (Cabanatuan, 2000, p. A27). All four of the above cities are excellent examples of cities in Sonoma County that are either well north of most of the area's central development (as is the case for Windsor and Cloverdale) or reasonable lateral distances (east and west) from the center of development along Highway 101 (Sonoma and Sebastopol).

Transportation Mode Choice

The specific sociological issue in this study centers on the choice or mode of transportation that people use and why they might choose these particular commuting options.

Verplanken, Aarts, Van Knippenberg, and Van Knippenberg (1994, p. 286) state that "travel mode behavior can be considered as being based on attitudes toward available mode options, in particular on the attitude toward the most promising alternative in the choice set." Wachs (1990) adds that travel behavior changes in substantial ways depending on the specific choices available to travelers.

When looking at commuters' modal choice, Bamberg and Schmidt (1998) found that providing an economic incentive (i.e., a reduced fare bus ticket) had a substantial impact on travel decisions and behavior. The offering and use of the low fare pass decreased automobile use by about 15%. Conversely, use of public transit (a bus) went up by 15%. In 1984, Surber, Shoup, and Wachs (Wachs, 1990) found that when a company paid for employee parking, 42% of workers drove alone. When the company canceled this parking plan the percentage of solo drivers fell to 8%. These two findings, although detailing different specifics, generally indicate that transit decisions can be based on economics. In regards to cost, Wachs (1990, p. 6) states that commuters are found to be more concerned with daily travel cost (e.g. gas, parking, and toll), or what he refers to as

"out-of-pocket expenses" rather than the initial, main, or "capital" cost of transporting oneself (e.g. automobile payments, insurance, or car maintenance). Wachs (1990) goes on to state that the United States is particularly prone to the modal choice of the automobile due to cost (e.g., comparably low gas prices, a low gas tax, access to most highways, and travel time.

In regards to time, Wachs (1990, p.9) points out that people are more concerned with arriving on time rather than time actually in traffic (Wachs refers to this time in traffic as "line-haul" time). People are more concerned with the "out-of-vehicle" time that is associated with trip connections when using public transportation. Barff, Mackay, and Olshavsky (1982) found a similar trend in relation to in-vehicle and out-of-vehicle time factor. Barff et al. (1982) state that many automobile commuters left for their destination earlier, even though they arrived far earlier than ideally necessary. Garling, Laitila, and Westin (1998) also mention that as the number of activities increases (adding constraints on time) the reliance on the automobile goes up even though a range of other transportation options may be available.

Wachs (1990) adds that other factors also play a role in regards to the choice of specific modes of transport. Those elements include privacy, security, convenience, and comfort. Barff et al. (1982, p. 377) concur that these "sensitivity vectors" of comfort and convenience are part of the decision making process of the commuter. Wachs (1990) specifies that it is not luxurious car interiors and stereos that are of the utmost importance for commuters in regards to the issue of comfort, but it is the concern about weather and temperature (e.g. proximity to an air conditioner or a heater). In regards to security, the link to the car is articulated by Lupton (1999, p. 60) as she writes that when "we enter and seat ourselves within a car...this tends to result in a somewhat illusory feeling of safety, of being isolated from the world outside."

Bamberg and Schmidt (1998) discuss a planned behavior framework where commuters need to have both the motivation to engage in a particular travel behavior and the ability to enact such an activity. With respect to the ability to commute in a particular fashion, Lerman and Ben-Akiva (1976; as referenced by Barff et al. 1982) state that the single crucial variable is car ownership, implying that if people have a car they will choose it as their mode of

transportation. Once people have a car, there may exist a powerful psychological connection between the driver and the car. "When one is driving, one becomes...a combination of human and machine" (Lupton, 1999, p. 59). Furthermore, Joint (1995; referenced in "Road Rage: Causes and Dangers of Aggressive Driving") points out that the car seems to be more than just one of a possible list of transportation options, and that it has an effect on self-esteem as it is a possession of great importance. Lovelock, Lewin, Day, and Bateson (1987) concur that a person's identity may be perceived as weaker if they use public transit over a private automobile. In fact, cars, for some, become a sign of status; that is, cars can be used as a status symbol. Berger, Webster, Ridgeway, and Rosenholtz (1986) state that expressive cues are ones that might include "a Cambridge accent, a lawyer's or doctor's word choices, or a firm, confident tone of voice" (p. 4). Berger et al. note that expressive cues are "given-off" during an interaction. (p. 4). In much the same way, one could argue that the symbol of a car (either its general use or the choice of a particular type of car) is used an expression of status.

Another study sheds additional light on what triggers transportation mode change and what does not. Ludemann

(1998) found that 52.5% of respondents would consider changes in the way that they traveled for the following three reasons: bad weather, flexibility, and speed. Only 1 respondent (out of 78) stated that they would alter travel modes due to environmental reasons (Ludemann, 1998). Garling, Laitila, and Westin (1998) write that as areas of industry and service become separate from residential locations, the use of the automobile as the main choice of transport is likely to rise. Garling et al. (1998) point out that these new housing zones that were once rural areas may also have main arteries that lead to large shopping malls, implying that the connection to such businesses promotes car usage.

Stern (1998) notes that fifteen firms in the Netherlands looked into the responses of their employees in regards to congestion and modal choice. The option of taking some type of public transport was ranked fifth out of a range of alternatives. Changing departure time, modifying work hours, adjusting one's driving route, and taking more work home were ranked as the top four. Commuters may employ another option other than those mentioned above to combat delays. A study by Elamatin (Stern, 1998) found that 9.6% of drivers engaged in illegal

driving behavior (such as speeding) to avoid congestion delays.

It is clear from the literature review that even though factors such as fare reduction and parking fee payment had an impact of modal choice, the reasons attributed to one choice of transportation over another have to do more with home location, activity increase, comfort, being on time, in-traffic time versus out-of-vehicle time, car ownership and the car/human relationship.

Hypotheses

Upon reviewing the current literature on the topic of mode travel choice, studying the background of traffic and travel dynamics in the Bay Area, and the current congestion situation in Sonoma and Marin counties, this author hypothesizes the following:

Hypothesis 1:

There will be an association between reliance on the automobile and the projected use of alternative transportation systems.

Explanation:

Even though this study's literature review finds no specific evidence pertaining to travel issues surrounding

the reliance on automobiles, it seems reasonable to hypothesize that due to comfortability factors (e.g. comfort and convenience), an association between reliance on a car and the projected use of alternative transportation systems will emerge (Barff et al., 1982; Luddeman, 1998; and Wachs, 1990). Additionally, it seems logical to expect that for respondents who heavily rely on their cars, factors such as comfort, convenience, and privacy will prove to promote automobile use over the use of public transportation.

Hypothesis 2:

There will be an association between the availability of an automobile and the projected use of alternative transportation systems.

Explanation:

Much evidence seems to indicate that the automobile is readily available to many people in the United States (United States Department of Transportation, 1992; Newman and Kenworthy, 1999; Vest et al., 1999; Richards, 2000). As also noted in this study's literature review, Lerman and Ben-Akiva (Barff et al., 1982) found that car ownership is the most important factor in transportation mode choice. People seem to be drawn to this particular modal choice

partly due to personal identity derived from car ownership (Lovelock et al., 1987, and Lupton, 1999). Lastly, the prevailing trend since the car's inception into U.S. society seems to be its usage over all other travel mode options.

Hypothesis 3:

There will be an association between the time spent in rush-hour traffic and the projected use of alternative transportation systems.

Explanation:

Given the fact that people who are consistently in peak-hour traffic are most probably commuting to places of employment, it seems reasonable to hypothesize that time in rush-hour traffic and projected use of alternative transportation systems will be related in some manner. This statement can be linked to points previously made in regards to concerns about out-of-vehicle time, overall comfortability, and concerns relating to time and the reliability of public transportation.

Hypothesis 4:

There will be an association between the amount of flexibility residents have regarding the time they have to be at work and the projected use of alternative transportation systems.

Explanation:

The general issue of time seems to be a critical factor in regards to the topic of transportation mode choice under consideration here. People are more concerned with arriving on time than the time they spend in traffic (Wachs, 1990). Again, in relation to time, people have more concern about the time they spend out of their vehicles (e.g. waiting at a bus stop) during a commute than time spent in a vehicle (Baraff et al., 1982). The concern about time constraints is so acute that people leave for their destination earlier than ideally necessary in order to use their car in more free-flowing traffic (Baraff et al., 1982). People seem to go to great lengths to be able to use their car, yet also arrive at work on time. As noted in this study's literature review, as the number of activities increases for people the reliance on the car goes up even though other travel options are present (Garling et al., 1998). Thus, there are convincing research findings that show that as concerns about time and

time constraints rise, the likelihood of public transportation usage goes down.

Hypothesis 5:

There will be an association between the distance residents live from future transit terminals and their projected use of alternative transportation systems.

Explanation:

The foundation of the above hypothesis comes from the findings of Garling, Laitilin, and Westin (1998) as they note that service and industry have become increasingly separated from residential locations. This is particularly true in relation to Sonoma County (e.g. Forestville, Sebastopol, and Occidental). These areas, to name only three cities among many, are well removed from where a projected rail terminal would be housed. The proposed ferry service would have its terminal at Point Sonoma at the border of Sonoma and Marin Counties clearly making it distanced from many residents in Sonoma County. Once removed from close proximity to these proposed terminal sites it is hypothesized that respondents would feel that this distance from transportation facilities would be inconvenient and would thus affect their travel mode choice.

CHAPTER 3

Methods

Research Instrument

The instrument that was employed in order to gather data for this study was a telephone survey. The number of survey questions was kept as brief as possible in order to take into consideration the limited amount of time any given individual would be able to (or would want to) allocate to a research phone call. Telephone interviews were chosen for this study in order to maximize the number of survey respondents. Given the amount of funds available for the work along with the fact that the research operation was to be conducted by a single interviewer, this researcher decided that more respondents could be reached via the phone than would be the case in going door to door and conducting face-to-face interviews. Moreover this study's focus and scope were believed to be highly conducive to interviews over the phone. It was determined that the topic and material that was to be discussed could

be considered non-sensitive. In addition, the scope of the questionnaire/interview design itself was constructed in a way that would insure brevity. This researcher thought that a general time threshold for the interview needed to be respected. An interview via the phone that goes over a reasonable length may lead to participant fatigue or a lack of continuing interest. In short, the respondent may eventually discontinue the conversation (i.e. hang-up). Given the concrete nature of the questions under consideration and the condensed scale of the question pool, an efficient and smooth data collection operation was projected and was realized. Finally, this work's questionnaire was designed in a way that would not be intimidating in terms of subject matter or difficult in structure. The hope was that such a format could stimulate considerable interest from participants, which it did on a number of occasions.

Study Location and Sample

Sonoma County, located in Northern California, borders Marin County (to the south). On a congestion-free Highway 101 (going 65 mph), a trip (from the outskirts of the County) south to San Francisco takes less than one hour.

To the east, Sonoma County borders Napa County. Lake County borders Sonoma County to the northeast, and the bordering county to the northwest is Mendocino. To the west rests the coastal waters of the Pacific Ocean. Sonoma County has a population of 458,614 (Census 2000; noted by Klose, March 21, 2001). Santa Rosa, with a population of 147,595 (count is from a census total from April, 2000, Klose, March 30, 2001) is the largest city in the County. The next largest city is Petaluma; the population within this location is 54,548 (see footnote 41). It is important to note here (as it relates to traffic and congestion) that Sonoma County is the fastest growing of the nine Bay Area Counties (Klose, March 30, 2001). The County numbers in regards to diversity are on the rise. The Latino population increased 93% since the 1990 Census. Latinos, representing the second largest ethnic group (compared to whites), had a population of 79,511 (Klose, March 30, 2001). It is important to note here that language barriers were never a major obstacle during the phone interviews. On two occasions this researcher had interviewees answer the phone in Spanish. This interviewer was not fluent in Spanish, and the participants in question did not have

command of English; thus, the interviews, in these cases, were not attempted.

This author first conducted a pilot study in order to test the research instrument (the telephone questionnaire). At the conclusion of the pilot study this researcher found the ratio of completed interviews to randomly selected telephone numbers to be about 4%. What is critical to note here is that while this particular method of building random phone numbers (which is discussed in detail below) did generate a random sample of residents, actually obtaining an interview was extremely difficult. During the course of the study, this author attempted 1600 randomly obtained phone numbers. Of those, a sample of 70 completed interviews was obtained. The above sample size was well over the critical or "magic threshold" (a term used by Dr. David Asquith of the San Jose State University Sociology Department) of 30 respondents. Thus, it is clear that this work conforms to a probability study. Due to the fact that 10,000 calls would be necessary to obtain at least 423 interviews using this method, this researcher made the decision to stop the research calls at 1600 attempts and use the sample size of 70.

The respondents were sampled by randomly picking from the Sonoma County telephone prefix pool which totals 159. This random selection was conducted with a aid of a random table of numbers. After each prefix was selected (Frankfort-Nachimas and Nachmias, 2000, refer to this prefix as "an exchange", p. 222), the prefix selected was put back (replaced) in the pool of possible prefixes. Next, the random number table was employed, once again, to identify the final four numbers. The intention here is to look up those four digits from the random table of numbers and use those exact numbers to fill in the last four telephone digits. The combination of picking a prefix and then the remaining four numbers created the randomly selected phone number. The inclusion of the 707 area code was not necessary since this researcher called from within the county; this insured that only respondents with Sonoma County prefixes were contacted. Only private residences were included in this study. Any number that directed a call to a business was excluded from the work.

Furthermore, in regards to the sample, the respondents needed to meet the age criteria of being at least 18 years old. Even though individuals can obtain a driving permit at fifteen-and-half and a driver's license at sixteen years

of age, this study focused on adults (respondents 18 and over). This segment of the population (fifteen-and-a-half-year-olds, sixteen-year-old, and seventeen-year-olds) was excluded because this study focuses specifically on working and non-working adults.

The study's random construction is backed not only by a carefully structured system of telephone number configuration, but, also with some additional facts along with a few anecdotal examples. This researcher attempted numbers (where, of course, the overwhelming majority were not in service or disconnected) that turned out to be connected to households, businesses, fax machines, cell phones, and pagers. On one occasion this author happened to call a woman eating lunch in a restaurant; on two other occasions, a phone booth in Sonoma, and the Symbolic Interactionism Laboratory at Sonoma State University were contacted via these random calls. In addition, this researcher received calls on a few occasions from people who had registered this researcher's number on their caller identification system. On at least two occasions those callers agreed to be interviewed for the study.

In order to assist in the elimination of contacting businesses, research calls were made during the evening and

on the weekends. Calling during these times did not exclude all businesses (e.g. restaurants), but this time structure significantly reduced the chance of this taking place. Additionally, calls within this set time frame allowed for a greater chance of possible respondents being at home and not at work.

A series of steps was put in place to minimize a kind of "telemarketer effect" that calls to personal residents can almost automatically create. Calls in the evenings were be made between 6:00 p.m. and 9:00 p.m. Most potential respondents would probably be returning home from work/errands by around 6:00 p.m., if not earlier. No call was made after 9:00 p.m. in order to be reasonably sure that calls were not made too late. Such a late call could unduly bother perspective research participants. Weekend calls were made on Saturdays from 10:00 a.m. until 9:00 p.m. No early morning calls were made on the weekends to ensure that a level of courtesy was upheld. Saturday and Sunday mornings are typically times for sleeping in or at least the existence of a slower morning schedule than one experiences during the week. The decision was made that it would be fruitful to attempt to contact potential respondents later in the morning as doing so could increase

the likelihood of participation in this study. No Sunday calls were made earlier than 11:00 a.m.

Furthermore, if an answering machine was reached (which happened quite often), this researcher did not leave a message. The number that was sampled and attempted was saved as an existing number and the same number was attempted again. This researcher attempted subsequent calls at different times. If no contact was made with a potential respondent after at least three attempts the number was discarded and a new number was sampled. If there was no answer at all, machine or not, the same guidelines mentioned above were followed.

In addition, if a respondent that was sampled and contacted wanted to participate in the study but was not able to be interviewed at the time of the initial call, this researcher called back at a later time. The decision was made, before the study began, that if a respondent began the interview but had to interrupt and thus terminate the survey at the time of the initial call, the survey would be considered nonusable. If a call back was attempted under the preceding circumstances there would be a chance for measurement error as respondents would have the opportunity to contemplate the specific questions and

topic before the next call. In short, all respondents were to answer the survey during one phone call.

Any variation of this policy would alter the structure of this particular type of study. In fact, it could be argued that it would (on the surface) be wiser in some ways to call ahead to each person and tell them the general topic of the study and some basic parameters of what using public transportation in the area would entail (this may enable the rationalization effect to be measured more accurately). A window of, say, two days could allow more reflection time than just listening to the study preface and then answering the survey questions. However, such a study including a pre-call followed by a main study call would have been extremely difficult if not impossible to initiate within the framework/resources of this present work.

Operationalization

The first dependent variable involving the likelihood of rail service use was operationalized with the following question: "How likely would it be that throughout a typical week you would regularly use such a light rail service?" In regards to both dependent variables (one

involving rail service and the other ferry service) the respondent was told how and where these transit systems would most likely operate with the use of two prefaces within the questionnaire. The details of such prefaces are (no doubt) only hypothetical, yet the statement was constructed with great care after considering all feasible location options (the prefaces addressed here can be found on the study instrument in the appendices). Additionally, the preface served as a critical conceptual framework for the respondents. The fear was, that without such a framework some respondents might answer questions "blindly" without considering criteria that would be crucial to obtaining a true reading of the rational choice behind transportation mode choice.

The response to the question pertaining to the participants' projected use of a rail system was coded using the following categories: (1) wouldn't use; (2) not likely; (3) likely; (4) very likely. After the initial data analysis these categories were recoded due to the distinct categories/groupings that emerged. The recoded categories were (1) wouldn't use and not likely to use together and (2) likely and very likely to use.

This study's second dependent variable, one that centers on the likelihood of high speed ferry use, was be measured with this question: "How likely would it be that throughout a typical week you would regularly use such a high speed ferry service?" The response to the question pertaining to the participants' projected use of a ferry system was coded using the following categories: (1) wouldn't use; (2) not likely; (3) likely; (4) very likely. After the initial data analysis these categories were recoded due to the distinct categories/groupings that emerged. The recoded categories were (1) wouldn't use and not likely to use together and (2) likely and very likely to use.

The first independent variable under consideration in this study centers the reliance on the automobile. This variable, introduced in Hypothesis 1, was measured using the following question: "In your daily life, how much do you rely on your car to get around?" This interviewer received open-ended responses (e.g., percentage) that were then coded into the following categories: (1) none; (2) a little; (3) sometimes; (4) a lot. Recoding was necessary here due to distinct categories/groupings that emerged in the data. Basically, the overwhelming majority of

respondents relied heavily on their cars. Thus, only two categories were feasible here. First the categories "none", "a little", and "sometimes" were combined to form a new recoded category. Second, the category "a lot", for reasons just mentioned, stood alone.

In operationalizing the concept of access to an automobile (specified in Hypothesis 2), the following question and measurement answers was used: "Do you have access to a car everyday?" Here the responses consisted of a "yes", "no", or answers that amounted to "not applicable".

The next independent variable (one of the components creating Hypothesis 3), dealt with the amount of time respondents are in peak-hour traffic. This issue was measured with the following question: "On a typical weekday, how much time are you in rush-hour traffic on 101?" Rush-hour in Sonoma County can be considered to be 5:30 a.m. - 9:00 a.m. and 3:00 p.m. - 7:00 p.m. These times were determined after considering general peak times on most highways, the specific carpool lane times along the Highway 101 corridor through Marin and Sonoma Counties, and via direct observation of traffic along this route. It should be noted that this researcher did not detail these

general peak-hour traffic times to the respondents. The assessment of rush-hour traffic and how much they were in such congestion was left up to the participant. Such a technique would not open up any significant validity questions as it seems reasonable to believe that residents of the County have a good understanding of what rush-hour is. Respondents had the flexibility to state what their average one-way or total daily peak-hour commute time was, or they were able to detail how much time they spent in traffic in the morning versus in the afternoon and evening. This researcher calculated a total from these figures. These totals were then coded using the following scale: zero minutes in rush hour traffic was coded as "none" and was ascribed the value of (1); 1 minute - 30 minutes in congestion was coded (2) "little"; 31 minutes to 1.5 hours was coded as (3) "moderate"; and more than 1.5 hours in this peak-hour traffic was coded (4) "a lot". Due, once again, to distinctive data categories/groupings that emerged in the data, this researcher recoded the responses for this variable. The responses in the categories of "none" and "little" were combined, and the categories of "moderate" and "a lot" were brought together.

The fourth independent variable (found in Hypothesis 4), one that centers on how much autonomy a respondent has in regards to arrival time at their place of employment, was measured with the following survey question: "If you are employed, is getting to work on-time essential for you keeping your job?" The response options to this question consisted of "yes", "no", and other responses that were coded as "not applicable".

In regards to Hypothesis 5(a), the topic of distance from a respondent's home and a proposed rail terminal is methodologically structured here with this question: "About how far in miles do you live from Highway 101?" This researcher noted the approximated mileage responses of the participants. These mileage approximations were studied and then coded using the following scale: (1) "less than a mile"; (2) "1-2 miles"; (3) "3-5 miles"; (4) "6-8 miles"; (5) "9-12 miles"; and (6) "over 12 miles". Again, due to the data groupings that emerged in the data, these groupings were recoded. The categories of "less than 1 mile" and "1-2 miles" were grouped; this maintained a category of responses that could be characterized as being close to Highway 101. The coding of "3-5 miles" was left to stand alone due to the adequate number of responses that

were found in the category. In the final analysis this serves as a distance that can be considered moderately close to Highway 101. Finally, the three categories "6-8 miles", "9-12 miles", and "over 12 miles" were combined and created a grouping of responses that can be considered to be a relatively lengthy distance from Highway 101.

The second component of the conceptual framework, found in Hypotheses 5(b), deals with factors involving high speed ferry transportation. During the final phase of the telephone interview respondents were read a statement (one of the prefaces discussed earlier) that specified the location of a potential ferry terminal. However, since it would be difficult for most respondents to quickly estimate the distance from their home to Point Sonoma with any sort of accuracy (thus, impinging on this variable's validity), this researcher used the respondents' telephone prefixes as a regional guide that could allow for a general reading of the city/county area of which they reside. The city/county regions that study respondents resided in are alphabetically listed in the following series of cities: Cloverdale, Guernville, Healdsburg, Monte Rio, Occidental, Petaluma, Santa Rosa, Sebastopol, Sonoma, and Windsor. It needs to be noted here, however, that the list of prefixes

(found in the Sonoma County Pacific Bell Smart Yellow Pages phone book) are linked to general city categories. For example, prefixes that are actually linked to phone numbers and residents in Rohnert Park would be found in the Santa Rosa category. However, such general information does allow for a reasonable approximation of County residence since certain city prefixes are put under another city names due to their proximity to one another. Using this prefix information that supplied the regional area of residence, this researcher proceeded with calculations of numerical distance (with the aid of a local scaled map; California State Automobile Association Map) from the general city/regional locations of the respondents in relation to Point Sonoma. Petaluma and Sonoma were grouped together as the closest cities to Point Sonoma (distances from the potential ferry terminal were 13 and 17 miles respectively). An estimation of 29 miles was calculated for both Santa Rosa and Sebastopol; these became the next grouping. The third grouping of cities by distance from the terminal location included Windsor (37 miles away), Occidental (37 miles away), Guernville (41 miles away), Monte Rio (42 miles away), Healdsburg (43 miles away), and Cloverdale which was 59 miles from the ferry terminal

location; the average distance from Point Sonoma within this third category was calculated to be 43 miles.

The statistical procedure employed in this study is Chi-square. Chi-square may be employed with nominal and/or ordinal data. Such data can be cross-tabulated. Analysis in regards to this procedure centers on finding out if a "significant difference" (Asquith, 1996, p. 9) exists within the cells of the table. Results are only significant if at the .05 alpha level or lower. The study questionnaire is attached in the appendix of this work.

CHAPTER 4

Results

This study had a sample size of 70. Of those 70 Sonoma County residents, gender was recorded for 68 respondents (gender for two residents was not noted on the questionnaire form). Of those 68 respondents, 31 (45.5%) were male and 37 (54.4%) were female.

Table 1a: Projected Use of Light Rail/Reliance on a Car

		RELIANCE	
		none/little/sometimes	a lot
projected regular use of light rail	wouldn't use/not likely	8 88.9%	43 72.9%
	likely/very likely	1 11.1%	16 27.1%
Total		9 100.0%	59 100.0%

Pearson Chi-Square: 1.067; p = .302

Table 1b: Projected Use of High-Speed Ferry/Reliance on a Car

		RELIANCE	
		none/little/sometimes	a lot
projected use of high-speed ferry	wouldn't use/not likely	9 100.0%	52 88.1%
	likely/very likely		7 11.9%
Total		9 100.0%	59 100.0%

Pearson Chi-Square: 1.190; p = .275

The results in Tables 1 a/b indicate that no statistical association exists between reliance on an automobile and the projected use of alternative transportation for Sonoma County respondents (light rail: $X^2 = 1.067$, $p = .302$; high speed ferry: $X^2 = 1.190$, $p = .275$). Residents do not seem to be basing their projected use of a light rail or high-speed ferry service on factors surrounding reliance on cars in any significant way. Thus, reliance on the automobile does not seem to be an issue that strongly directs their choices on vehicle mode choice. Hypotheses 1 is not supported by the results found in Tables 1 a/b. So, even though most residents rely on their car most of the time, this fact alone is not related to transit choice.

Table 2a: Projected Use of Light Rail/Access to a Car

		access to car everyday	
		yes	no
projected regular use of light rail	wouldn't use/not likely	48 75.0%	3 100.0%
	likely/very likely	16 25.0%	
Total		64 100.0%	3 100.0%

Pearson Chi-Square: .985; p = .321

Table 2b: Projected Use of High-Speed Ferry/Access to a Car

		access to car everyday	
		yes	no
projected use of high-speed ferry	wouldn't use/not likely	57 89.1%	3 100.0%
	likely/very likely	7 10.9%	
Total		64 100.0%	3 100.0%

Pearson Chi-Square: .366; p = .545

The data in Tables 2 a/b show that, like reliance, there is no statistical association between access to a car and the projected use of alternative transportation systems in Sonoma County (light rail: $X^2 = .985$, $p = .321$; high-speed ferry: $X^2 = .366$, $p = .545$). Thus, Hypothesis 2 is

not supported by this data. Even though most residents have access to a car, no statistical relationship exists that ties this fact to projected modal choice.

Table 3a: Projected Use of Light Rail/Time in Rush-Hour Traffic

		time in rush-hour traffic	
		none/little (0-30 mins.)	moderate/a lot (31 mins. - 1.5 hrs. +)
projected regular use of light rail	wouldn't use/not likely	43 79.6%	8 57.1%
	likely/very likely	11 20.4%	6 42.9%
Total		54 100.0%	14 100.0%

Pearson Chi-Square: 2.998; p = .083

Table 3b: Projected Use of High-Speed Ferry/Time in Rush-Hour Traffic

		time in rush-hour traffic	
		none/little (0-30 mins.)	moderate/a lot (31 mins. - 1.5 hrs. +)
projected use of high-speed ferry	wouldn't use/not likely	50 90.9%	11 84.6%
	likely/very likely	5 9.1%	2 15.4%
Total		55 100.0%	13 100.0%

Pearson Chi-Square: .451; p = .502

The reader will note that there is no association between time in rush-hour traffic and projected use of alternative transportation systems (light rail: $X^2 = 2.998$, $p = .083$; high-speed ferry: $X^2 = .451$; $p = .502$). Thus, Hypothesis 3 is not supported. Residents' projected transit modal choices are not related to time in rush-hour traffic.

Table 4a: Projected Use of Light Rail/Flexibility with Arrival Time at Work

		on-time essential	
		yes	no
projected regular use of light rail	wouldn't use/not likely	19 63.3%	14 73.7%
	likely/very likely	11 36.7%	5 26.3%
Total		30 100.0%	19 100.0%

Pearson Chi-Square: .567; p = .452

Table 4b: Projected Use of High-Speed Ferry/Flexibility with Arrival Time at Work

		on-time essential	
		yes	no
projected use of high-speed ferry	wouldn't use/not likely	27 90.0%	17 89.5%
	likely/very likely	3 10.0%	2 10.5%
Total		30 100.0%	19 100.0%

Pearson Chi-Square: .004, p = .953

In looking at Tables 4 a/b, no evidence exists to confirm Hypothesis 4. There is no association between the amount of flexibility residents have regarding the time they have to be at work and their projected use of alternative transportation systems (light rail: $X^2 = .567$, $p = .452$.; high-speed ferry: $X^2 = .004$, $p = .953$). Thus, residents projected decisions surrounding mode choice are not related to the issue of time that is detailed above.

Table 5a: Projected Use of Light Rail/Distance Living from Highway 101

		distance from Hwy. 101		
		less than 1 mile - 2 miles	3-5 miles	6 or more miles
projected regular use of light rail	wouldn't use/not likely	17 60.7%	12 75.0%	22 91.7%
	likely/very likely	11 39.3%	4 25.0%	2 8.3%
Total		28 100.0%	16 100.0%	24 100.0%

Pearson Chi-Square: 6.603, p = .037

Table 5b: Projected Use of High-Speed Ferry/Distance from Point Sonoma

	Regional Location Distance from Point Sonoma		
projected use of high-speed ferry	Petaluma/ Sonoma (15 miles – aver.)	Santa Rosa/ Sebastopol (29 miles)	Windsor/Healdsburg/ Cloverdale/Occidental/ Guernville/Monte Rio (43 mile aver.)
wouldn't use/not likely	5 62.5%	37 92.5%	10 90.9%
likely/very likely	3 37.5%	3 7.5%	1 9.1%
Total	8 100%	40 100%	11 100%

Pearson Chi-Square: 5.837; p = .054

Table 5a indicates that the distance that residents live from Highway 101 and residents projected use of light rail are statistically associated (X^2 = 6.603, p = .037). Thus, Hypothesis 5 is confirmed, in part. For Sonoma County residents, the distance that people live from

proposed rail terminals seem to have some impact on their projected modal choices.

Table 5b shows the results for the distance respondents live from Point Sonoma and their projected use of a high-speed ferry system. No statistical association is found between these two variables, thus, this component of Hypothesis 5 is not confirmed ($X^2 = 5.837$, $p = .054$). However, the reader will note that statistical significance is almost found.

CHAPTER 5

Discussion

The findings in Tables 1 a/b do not support previous findings in the literature. Previous research has indicated that factors such as comfort and convenience (which this author has connected with reliance, see Hypothesis 1, Explanation) affect modal choice (Barff et al., 1982; Luddeman, 1998; and Wachs, 1990), yet, similar findings do not emerge here. The lack of the relationship between reliance and alternative transportation may be explained by the fact that the measurement of reliance on a car did not capture the concepts of comfort and convenience.

Even though there is no statistically significant association between access to a car and transit choice, the results in Tables 2 a/b suggest that the variable, access to a car, may have some impact on modal choice. Forty-eight respondents out of 64 (75%) who had access to a car stated that they would not use or would be unlikely to use rail service, and 57 out of 64 respondents (89.1%) who had access to a car stated that they would not use or would be

unlikely to use a ferry service. This tends to lend credence to Lerman and Ben-Akiva (cited in Barff et al., 1982), Lovelock et al. (1987), and Lupton's (1999) findings regarding the importance of car ownership in relation to the choice of using the automobile for transport.

As is noted above, this study reveals that reliance on a car and access to a car are two of the four study factors not associated with the projected regular use of alternative transportation for residents in Sonoma County. It is possible that since the majority of people both rely on a car (87% or 59 out of 68 respondents) and have access to a car (95% or 64 out of 67 respondents) most of the time, other variables (e.g., the distance transit terminals are from people's homes) with more impact on people's daily lives/decisions might be related to modal choice.

The results in Tables 3 a/b suggest that Sonoma County residents, when considering vehicle mode choice, may not take into account factors specifically linked to time in rush-hour traffic. However, the findings suggest that those who are rush-hour traffic for more than 30 minutes are slightly more likely to use light rail than those who are in rush-hour traffic less than 30 minutes (42.9% vs. 20.4% respectively). Further investigation will be needed

to uncover more about this variable. For example, time in gridlock and the overall distance a person commutes might be associated with modal choice.

The results in Tables 4 a/b did not support the past findings that suggest the relationship between time constraints and alternative transportation (Baraff et al., Garling et al., and Wachs, 1990). For Sonoma County residents, the issue of being on time to work does not have a significant impact on their transit mode decisions. This finding may be explained by the fact that 39% of respondents (or 19 out of 49) have flexible schedules that allow for their varied arrival times. The flexible schedules do not necessitate respondents to choose alternative transportation.

The statistically significant relationship found in Table 5a between the projected use of light rail and the distance Sonoma County residents live from Highway 101 suggests the need to look further into the issue of rail extensions. The choices residents make may connect with a perceived sense of convenience or inconvenience of specific types of transportation options. This assessment might connect with the choice of transit residents consider most feasible in terms of distance from their home.

The results in Table 5b are almost significant. This, once again, lends credence to the fact that this independent variable, distance from proposed alternative transit locations, should be looked at closely in future work centering on modal choice.

CHAPTER 6

Conclusion

This study can be considered a first step in the scientific investigation of modal choice issues in Sonoma County.

This work indicates that the variable, distance residents live from proposed rail transit terminals, plays a significant role in the projected use of light rail in Sonoma County. Regions that have only select locations for alternative transportation terminals will not be able to provide viable options for all residents who might consider public transit. For that reason, Sonoma County representatives, engineers, and voters should pay particular attention to the kinds of rail systems that are proposed. A service that only runs north to south on or along Highway 101 will not generate the kind of ridership that will reduce congestion by large levels or move the region in direction of more sustainable transit systems. It is this issue of distance from public transit terminals that should be the focal point of future research. Studies can investigate the number of terminals that would be

optimum in a county by assessing what would be a reasonable average distance from terminals to personal homes. The issues that surround the particulars of rail construction are tremendously important. The construction of transit systems that do not properly meet the needs of County residents will translate into projects that fail to use taxpayer monies properly (the figures would reach the billions for these types of projects). Furthermore, projects that do not pay careful attention to the transit mode decisions that people make now and will make in the future, will fail to create services that really impact the way of life of Sonoma County residents.

The Metropolitan Transportation Commission (MTC) projects that the Bay Area will undergo a "29 percent increase in population and a 42 percent increase in jobs between 1990 and 2020" (1998 Regional Transportation Plan, letter of introduction). In addition, "transbay travel demand...will increase by approximately 25 percent by the Year 2010" (San Francisco Bay Crossing Study, 1991, p. 4). When considering the above along with the fact that "...Sonoma County is likely to face unprecendented growth pressures in the future" (Chorneau, 2000, p. A18), the critical issue of traffic congestion and its effect on the

daily lives of thousands of residents in Sonoma County comes into full view.

Currently, the gridlock that begins in Sonoma County and extends through Marin County in a variety of areas is, unfortunately, a reality that will not dissipate anytime soon. The light rail service that is addressed in this study is not in existence today, and is not slated for construction in the near future. The high-speed ferry system is closer to becoming a reality, yet, it too is not expected to begin service for some time. Thus, as Sonoma County's popularity and population grows, these traffic conditions will only worsen. This will translate into even more hours in gridlock. These hours could, alternatively, be spent at home with family members, or the time in stop-and-go traffic could, instead, be spent being productive at places of employment. In addition, if alternative transportation systems were built and actually used by large numbers of residents, fuel consumption and engine emissions could be reduced.

The Sonoma County Transportation Authority created a report entitled "Getting Around Sonoma County in 2020...A Vision for Our Future" (1999). The above agency advocates transportation goals that include the use of bicycles,

buses, and trains; these travel modes, the agency argues, will assist in the creation of a more free-flowing freeway. Yet, the real issue does not necessarily center on the myriad of transit alternatives that be constructed, but how to get people to consider using such systems. Thus, transit systems will have to be developed that fit the needs of those who may, in fact, consider them as an option. The key example from this study is accessibility of light rail. If more residents are going to consider rail a feasible option for getting to and from work or running errands, then lateral rail networks need to be constructed along with a basic or central north to south County track. In short, a light rail needs to be brought to all residents; lateral extensions need to reach all the majority of Sonoma County communities in order to make rail transit a viable, if not attractive, option.

Other incentives for public transit can be introduced. Transit systems can be cost-effective for commuters. Marketing campaigns can point out the savings that can be accrued with commuters not having to pay the capital expenses (initial cost of car, insurance, regular maintanence, etc.) that surround car travel. Gas taxes and

prices can be raised in order to counter increasing levels of air pollution. Even a freeway fee can be introduced.

What is clear from this study is that the majority of Sonoma County residents (commuting or not) are not interested in using alternative transportation systems. Yet, the residents of this County and others need to ask themselves if this is a sustainable transit approach for the future. Domencich and McFadden (1975) point out that a city relies on its systems of transport; such a system needs to be efficient if urban economies are to stay healthy. Transportation in Sonoma County today is anything but smooth and efficient during peak travel times. The sooner the County responds to these transportation issues in ways that center on the real needs of residents, the sooner a healthy transport system will be in place, and the sooner Sonoma County residents can be off of the congested and dangerous Highway 101 and in their homes and places of business.

Future investigation into the factors influencing modal choice should center around the distance that people live from transit terminals. Studies can explore the optimum proximity of terminals to people's places of residence. This could lead to a more concrete assessment

of where future alternative transportation terminals could be constructed. In addition, future studies should consider investigating variables that center on the comfort and convenience of different types of transit and the total distance people commute; these studies can explore whether or not these variables significantly affect modal choice.

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Appendix

Questionnaire

Telephone Survey

Interviewer: Campbell J. Bullock
Respondents: Randomly Sampled Sonoma County Residents

Randomly sampled telephone number: _____
Date of call: _____
Day of week: _____
Time of call: _____

Answer: Yes No 2nd Attempt _____
Final Attempt _____

[ ] Call back suggested...
Best Day/Time to Call: _____

Opening comment by interviewer:

Hello, my name is Cam Bullock...I'm graduate student at San Jose State University. I'm conducting a very brief survey on transportation issues and your phone number was randomly sampled. If you choose to participate in this study your phone number will not be linked to the study in any way. Would you be willing to participate in this two minute survey?

1. Are you at least 18 years of age? (If not, I will ask if there is another resident there who is and would be willing to take part.)

   18 or older _____

2. In your daily life, how much do you rely on your car to get around?

3. Do you have access to a car everyday?

4. On a typical weekday, how much time are you in rush-hour traffic on 101?

   Morning:_____ Afternoon/Evening:_____

5. If you are employed, is getting to work on-time essential for you to keep your job?

6. About how far in miles do you live from Highway 101?

Please answer the following questions as if there was a light rail system in Sonoma County running North/South down Highway 101. Such a rail system would make one stop in each town that was right next to 101. No side rail routes would be available.

7. How likely would it be that throughout a typical week you would regularly use such a light rail service?

If yes... "For what purposes might you use the light rail?"

If no... "Could you please tell me why you would not use the light rail?"

-or-

"Could you please tell me why you would only use the light rail occasionally?"

Please answer these final two questions as if there was a high speed ferry service located in Sonoma County. Such a service would begin at Point Sonoma near the border of Petaluma and Marin Counties and depart for points around the Bay.

8. How likely would it be that throughout a typical week you would regularly use such a ferry service?

   If yes... "For what purposes might you use the ferry?"

   If no... "Why wouldn't you use the ferry service?"

   -or-

   "Why would you only use the ferry service occasionally?"

9. Is there anything you would like to add?

Would you like a phone number you can contact in order to obtain the results of this study?

I would like to thank you very much for your time and your help with this survey.

Sampling Procedure

This study employed a telephone survey. A random sample of Sonoma County residents was achieved by pooling from all the county prefixes (159 total prefixes). First, this researcher blindly picked two consecutive numbers from a random table of numbers. These two numbers were used to locate a prefix from Sonoma County. All prefixes have been coded (01-159) to accommodate this sampling procedure. The concern in regards to the three-digit coded prefixes (listed as 100-159, 60 prefixes in all) was resolved with the sampling sequence below.

First two picks	=	between 01-99
Third pick	=	between 100-159
Fourth pick	=	between 01-99
Fifth pick	=	between 100-159

At this point this sequence was repeated.

The above sequence consisted of an alternating proportional sampling order that allowed this researcher to arrive as close as mathematically possible to the actual prefix proportions [60/159 = 0.3774; this proportion/percentage will be rounded to 0.40 for this study]. When following this procedure this researcher was be able to sample the following proportions:

- Out of 20 picks, 8 prefixes from the 100-159 coded prefixes were sampled.
- Out of 40, 16 of the above prefixes were sampled.
- Out of 100, 40 of the prefixes mentioned above were sampled.
- Out of 423, 162 of the three-digit prefixes were sampled.

This meets up with the mathematical requirements (rounded) allowing for this sample to indeed be representative of all Sonoma County prefixes.

When using the random table of numbers to seek one of the coded 100-159 this researcher essentially ignored the hundreds place in the number and inserted the two numbers into the tens' and ones' places. In the course of random sampling during this procedure, if a two-digit number that began with a 6, 7, 8, or 9 was selected, this researcher re-picked until arriving at a usable randomly picked number (a two-digit number beginning with 0 - 5).

After picking pilot study and then full-study prefixes this researcher then blindly picked a string of four consecutive numbers that constituted the remaining digits of the county phone numbers.

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AVP, Graduate Studies & Research

Date: July 31, 2001

The Human Subjects-Institutional Review Board has approved your request for exemption from human subject's review under category "B" in the study entitled:

> "The Modal Choices of Commuters in Sonoma County: An Investigation into the Likelihood of Respondents Using Projected Rail and Ferry Services."

This approval is contingent upon the subjects participating in your research project or the subject's data collected for the research project being appropriately protected from risk. This includes the protection of the anonymity of the subjects' identity when they participate in your research project and concerning all data that may be collected from the subjects. The Board's approval includes continued monitoring of your research to assure that the subjects are being adequately and properly protected from such risks. If at any time a subject becomes injured or complains of injury, you must immediately notify Nabil Ibrahim, Ph.D. Injury includes but is not limited to bodily harm, psychological trauma, and release of potentially damaging personal information.

Please also be advised that all subjects need to be fully informed and aware that their participation in your research project is voluntary, and that he or she may withdraw from the project at any time. Further, a subject's participation, refusal to participate, or withdrawal will not affect any services that the subject is receiving or will receive at the institution in which the research is being conducted. This approval is granted for a one-year period and data collection beyond July 30, 2002 requires an extension request.

If you have any questions, please contact me at (408) 924-2480.